

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
22 April 2004 (22.04.2004)

PCT

(10) International Publication Number
WO 2004/033099 A3

(51) International Patent Classification⁷: **G01N 21/00**,
B01L 3/00, C12M 1/32

(21) International Application Number:
PCT/US2003/031806

(22) International Filing Date: 8 October 2003 (08.10.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/416,927 8 October 2002 (08.10.2002) US

(71) Applicant (for all designated States except US): **UNIVERSITY OF VIRGINIA PATENT FOUNDATION**
[US/US]; 1224 West Main Street, Suite 1-110, Charlottesville, VA 22903 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **LANDERS, James, P.** [US/US]; 633 Nettle Court, Charlottesville, VA 22903 (US).

(74) Agent: **GREENBAUM, Michael, C.**; Blank Rome LLP,
600 New Hampshire Avenue, N.W., Suite 1100, Washington, DC 20037 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

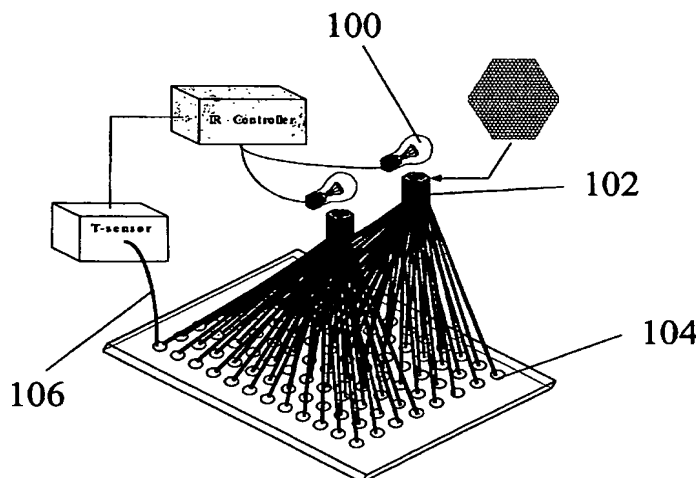
Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:
29 July 2004

[Continued on next page]

(54) Title: METHODS AND SYSTEMS FOR MULTIPLEXING IR-MEDIATED HEATING ON A MICROCHIP



(57) Abstract: The present invention relates to methods and systems for rapid multiplexed heating of a plurality of small volume samples on a microchip (200). More specifically, the present invention relates to methods and systems for non-contact temperature cycling of the samples using infrared (IR)-mediated heating of small, micro to nanoliter, volume samples, wherein each cycle can be completed in as little as a few seconds. Depending on the system used, the present invention involves a spinning microchip (200) or immobile microchip (200) having a plurality of micro-heating areas thereon. In the case of the spinning chip (200), the micro-heating areas are located in a circular configuration on the chip (200), so the micro-heating areas can be accessed by static heating sources by spinning the microchip (200). In case of the immobile microchip (200), fiber optics are used to direct radiation from a heating source or multiple heating sources directly to the micro-heating areas on a microchip (200).



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/31806

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G01N 21/00; B01L 3/00; C12M 1/32
 CL : 435/287.2, 288.4, 288.5; 422/64, 102, 109

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 435/287.2, 288.4, 288.5; 422/64, 102, 109

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X — Y	US 2001/0029036 A1 (LANDERS et al.) 01 October 2001, see paragraph #20, #28, #70, #75, #95.	1,2,7,12-16,18 3,4,5,6,8,9,17
X — Y	US 6,440,724 B2 (BERTLING) 27 August 2002, see col. 2, lines 18-23.	1,2,3,7,15,16,18,27,28 29,31
X,P — Y,P	US 2003/0113907 A1 (ROBERTS et al.) 19 June, 2003, see paragraph #24, #37.	5,6 1,8,9,15,18,27,28,31 23,27
A	US 5,587,128 A (WILDING et al.) 24 December 1996, see figure 3B, element 53.	1-38

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

02 April 2004 (02.04.2004)

Date of mailing of the international search report

18 MAY 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, Virginia 22313-1450

Facsimile No. (703) 305-3230

Authorized officer

Robert Warden

Telephone No. 703-308-3910